PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

BC hydro

BRITISH
COLUMBIA

A Reconnaissance Survey Of Royer Lake

D. A. Jesson
1989

PWFWCP Report No. 94

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave. 3rd Floor, Prince George B.C. V2L 3H9

Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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A RECONNAISSANCE SURVEY OF

ROYER LAKE

WATERSHED:	PARSNIP RIVER
DATE OF SURVEY:	JUNE 29. 30. 1989
FIELD CREW LEADER:	D. A. JESSON
FIELD ASSISTANT:	M. G. LABACH
REPORT PREPARED BY:	D. A. JESSON

WILLISTON FISHERIES PROJECT

B. C. HYDRO

ENVIRONMENTAL RESOURCES

and

MINISTRY OF ENVIRONMENT

RECREATIONAL FISHERIES BRANCH

RELEASED BY: _____

D.H.G. Ableson, Regional Fisheries Biologist

LAKE: ROYER **SYSTEM NAME: UNNAMED C.**

A.S.A.P. REFERENCE NO.: **SYSTEM NO: 230-9068-439-822-190**

DATA ON FILE FOR THIS SURVEY

Location	x	Dissolved O2/Temp. Profiles	x
Physical Data	-	Netting Record	x
Bench Mark	x	Lake Catch Summary	x
Terrain Features	x	Individual Fish Data	x
Access	x	Fish Preserved	-
Resorts and Campsites	x	Stomach Analysis	x
Other Developments	x	Scale Reading	x
Obstructions and Pollutions	x	Location of Inventory Sites	x
Special Restrictions	x	Photograph Directory	x
Aquatic Plants	x	Appendices:	
Wildlife Observations	x	A: Water Chemistry Analysis	x
Miscellaneous Comments	x	B: Tributary Stream Data	x
Lake Drainage	x	Bathymetric Map Reduction	-
Fisheries Management Comments	x	Bathymetric Map	-
History of Previous Surveys	x		
Water Chemistry Summary	x		

LOCATION

Location:	32 km south of Mackenzie		
Elevation:	817 m +/-		
Latitude/Longitude:	55°02'31":123°11'17"	U.T.M.:	10.4880.60993
Management Unit:	7-24	N.T.S. Map No.:	930/3

Drainage: Outlet C. –> Holder C. –> Pack R. –> Tudyah L. –> Pack R. –> Williston Lake (Parsnip Reach) –> Peace R.

PHYSICAL DATA

Lake Drainage Area:	- km^2	Volume:	* m^3
Water Surface Area:	estimate 390,500 m^2	Flushing Rate:	
Area above 6 m contour:	* m^2	Perimeter of Islands:	* m
Shoreline Perimeter:	estimate 3,500 m	Number of Islands:	0
Maximum Depth:	at least 10.5 m	Mean Depth:	* m
Filterable Residue (TDS):	76 mg/l	Secchi Reading:	4.45 m

Sounding Device: * Elevation Source: Contour interpolation

BENCHMARK

(Iron spike, center of red circle) located 2.0 m above present water level in a 28 cm diameter Lodgepole pine tree, on most northerly point on east shore of lake. Tree is 2.5 m from water's edge.

High water mark: 5 cm above water level at time of survey.

* Note: Outboard breakdown allowed for only partial physical data collection and no bathymetric map production.

Lake: ROYER

TERRAIN FEATURES

Immediate Shoreline:

The shoreline is moderately sloped and treed to the water's edge in all areas, except for the low sloping marsh area at the north (inlet) end of the lake and the outlet end. A brush border consisting predominantly of alder, fronts most of the shoreline. Marsh areas consist of sedge grass, willow and some stunted spruce. Land and boat access to the shoreline is restricted to the east and west shores and ranges from fair to good. Some deadfall exists in the water along the steeper shoreline areas, while a ridge of grasses/Nuphar sp. occurs along the east/west shores, extending one to two meters into the water. Access to the outlet by boat requires a final walk over a large expanse of deadfall. Generally, the lake bottom drops off quickly from shore (east and west shores) except for shallows at the inlet and outlet ends of the lake. Some gravels and cobble mixed with predominantly fines make up the east/west shorelines while organics dominate the marsh areas.

Surrounding Country:

The surrounding country is characterized by low-lying, gently rolling hills. The forest cover is complete and consists of a maturing forest of spruce, Lodgepole pine, poplar and some alder. Coniferous species represent 70 percent of the forest, while deciduous species represent 30 percent. Evidence of an old forest fire is present in the vicinity of the bench mark.

Royer Lake is situated within the sub-boreal spruce biogeoclimatic zone.

Lake: **ROYER**

ACCESS

Directions:

Royer Lake is at present a fly in only lake with possible road access, via cut block establishment, within the next three years. It is approximately a 20 minute ride by helicopter from Windy Point.

Road Type and Conditions:

Not applicable.

Restrictions:

No restrictions were noted.

RESORTS AND CAMPSITES

None. Recreation site potential is present at the northeast corner of the lake once road access is established.

OTHER DEVELOPMENTS

None.

Lake: ROYER

OBSTRUCTIONS AND POLLUTIONS

Access by boat to the outlet is hampered by a log jam. The jam is not an obstruction to fish passage.

SPECIAL RESTRICTIONS

None noted.

AQUATIC PLANTS

Aquatic plants are abundant occurring mainly in the shallows close to the lakeshore perimeter. The following species were identified in the field. None were collected.

Nuphar sp.

Potamogeton richardsonii

Equisetum fluviatile

Sedge grass

Myriophyllum sp.

Potamogeton sp.

WILDLIFE OBSERVATIONS

One loon was sighted.

MISCELLANEOUS COMMENTS

Outboard motor breakdown did not allow the lake to be sounded and the limited mobility only permitted a limno station close to the camp (near benchmark).

Freshwater clams and snails noted in shallows.

Bathymetric map: The lake outline is from an enlargement of aerial photograph BC7443 No.207, flown September 3, 1972.

Lake: **ROYER**

LAKE DRAINAGE

General:

Royer Lake has one inlet and one outlet. The inlet is lake headed. The outlet drains south 4 km to Holder Creek, a tributary to the Pack River.

Major Systems:

There are no major systems.

Minor Systems:

Unnamed C. - inlet

The inlet enters the lake at the north end through a large marsh area. Helicopter reconnaissance of the inlet found a series of beaver dams and ponds in close proximity to the lake (see plate #2). No suitable salmonid spawning habitat was evident. The upper reaches of the inlet flow through a chain of small lakes. These sections were not investigated.

Unnamed C. - outlet

The outlet appears to provide the majority of salmonid recruitment to the lake with good spawning and rearing habitat within 100 m of the lake. At 75 m downstream of the lake, the creek has a velocity of 0.5 m/s and water temperature of 15°C. The gradient is 3.5%, the average wetted width 2.8 m, the mean depth 8.0 cm and the bed material 45% gravel. Stable undercut banks, root wads, LOD and boulders provide cover for rearing and there is a good pool/riffle ratio. Evidence of this year's spawning (redd formation) is present. Aerial photograph BC 7443 No.207 indicates the outlet becomes a large marsh 200-300 m downstream of the lake, thus limiting the habitat available for salmonid production. Possible enhancements on the outlet include the placing of additional spawning gravel and the removal of a debris jam at the lake.

Lake: **ROYER**

FISHERIES MANAGEMENT COMMENTS

The outlet of Royer Lake has salmonid spawning and rearing potential for approximately the first 200 m downstream of the lake. An abundance of coarse fish in the lake, particularly northern Squawfish and suckers, may make conventional stocking futile. However, with the potential of stocked rainbow spawning in the outlet it may be worthwhile stocking with a strain that may have a higher survival rate in coarse fish lakes i.e. Blackwater River stock.

Placing of additional spawning gravel in the outlet and removal of a debris jam at the lake are two enhancements recommended once road access is established and a stocking program initiated.

A lake rehabilitation with rotenone is not practical for Royer Lake due to the extensive inlet marsh area that cannot be drained.

HISTORY OF PREVIOUS SURVEYS

Lake Surveys:

None known.

Other Related Surveys:

None known.

Lake: **ROYER**

WATER CHEMISTRY SUMMARY Limnology Station No. 1

Field Conditions:

Date:	June 29, 1989		
Time:	1400 hrs	Air Temperature:	15°C
Wind Velocity:	5-10 km/hr	Wind Direction:	Southwest
Cloud Cover:	9/10 O.C.	Surface Condition:	ripple
Secchi Disc:	4.45 m	Water Colour:	tannic (tea colour)

Method(s) Used:

Dissolved Oxygen:	YSI model 58 oxygen/temperature meter
Water Temperature:	YSI model 58 oxygen/temperature meter
Air Temperature:	Hand-held alcohol thermometer
pH (field):	Hach colour comparitor
H2S (field):	Hach H2S field test kit
Laboratory Used:	Zenon Environmental Inc. B.C. Laboratory Services
Water Sampler:	Verticle Alpha Water Bottle (Vandorn)
Substrate Sampler:	Substrate sample not taken

Water Sample Chemistry: SEAM Site No.: Not determined

	Sampling Depths	
	Surface (0 m)	Lower (9.0 m)
pH (field)	8.5	6.8
pH (lab)	7.9	7.2
Specific Conductance (lab):	109 umhos/cm	121 umhos/cm
Filterable Residue 105°C (lab):	76 mg/l	86 mg/l
H2S (field)	- mg/l	0 mg/l

Bottom Depth:	10.5 m
Substrate Sample Depth:	- m

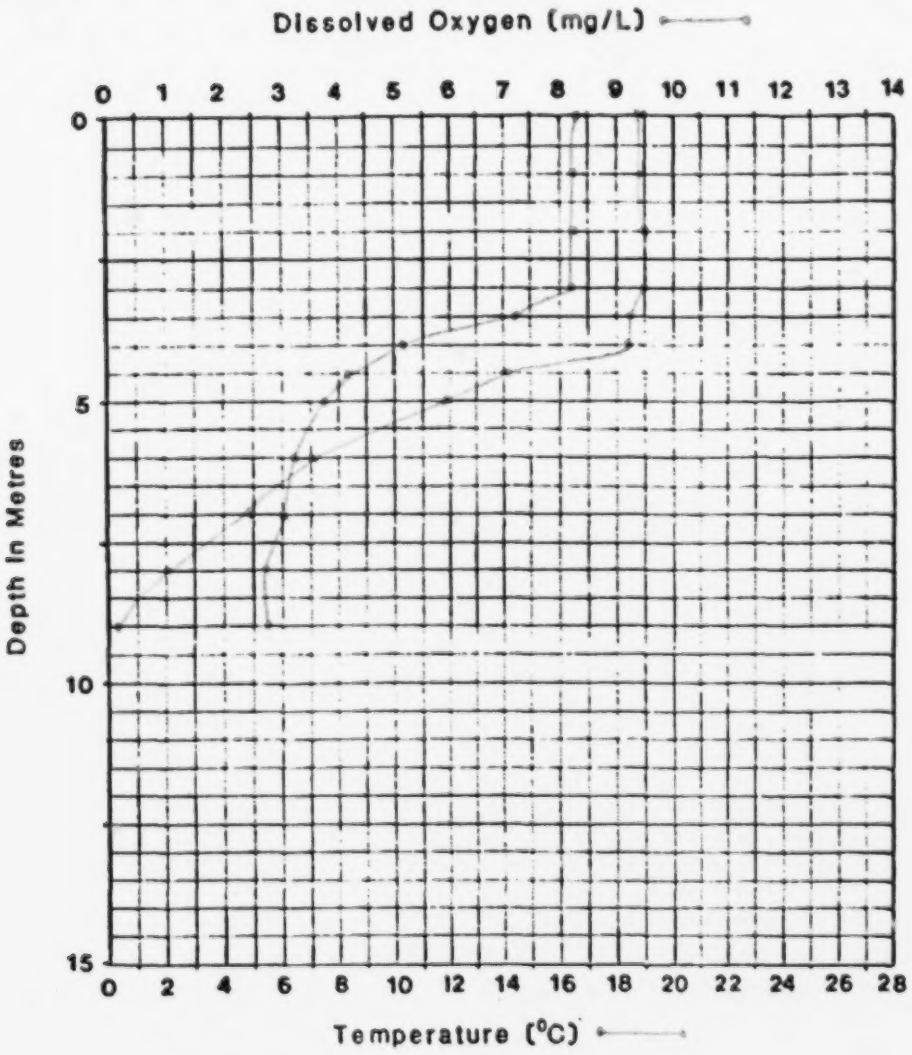
Note: Sample too long in transit to guarantee accuracy of pH (lab).

Lake: **ROYER**

OXYGEN/TEMPERATURE DATA

Depth (m)	02 (mg/l)	Temp (°C)
surface	9.4	16.7
1.0	9.4	16.6
2.0	9.5	16.5
3.0	9.5	16.4
3.5	9.3	14.5
4.0	9.2	10.3
4.5	7.1	8.4
5.0	5.9	7.5
6.0	3.6	6.4
7.0	2.4	6.0
8.0	1.1	5.4
9.0	0.2	5.6
10.5	Bottom	

DISSOLVED OXYGEN AND TEMPERATURE PROFILE



Lake: **ROYER**

NETTING RECORD

Mesh sizes experimental order: 25,76,51,89,38,64 mm.

NETTING SITE #1

Type:	Sinking Monofilament		
Date Set:	June 29, 1989	Time:	1030 hrs
Date lifted:	June 30, 1989	Time:	1000 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth:	1.5 m
		Substrate:	organics
Deep End Mesh Size:	64 mm	Depth:	5.0 m
		Substrate:	organics

Comments:

Lake: **ROYER**

LAKE CATCH SUMMARY

SPECIES	NET SITE NO. 1	2	3	4	ANGLED	OTHER	TOTAL	NUMBER SAMPLED	NUMBER PRESERVED	SIZE RANGE (cm)
Rainbow trout	4				1	-	5	5	--	13.1 - 34.8
Mountain Whitefish	51				-	-	51	30	--	14.4 - 30.0
Northern Squawfish	4				4	-	12	--	--	26.5 - 41.0
Coarse sucker	14				-	-	14	--	--	32.0 - 38.0
Lake chub	152				1	-	153	--	--	20.0 - 25.0
Longnose sucker	19				-	-	19	--	--	28.0 - 43.0
Redside shiner	2				-	-	2	--	--	7.0

MINNOW TRAPS:

BAIT: Sardines

#	HOURS	DEPTH (m)	SUBSTRATE	SPECIES	SIZE RANGE (cm)
1	26.5	0.5	Organics	1 Longnose sucker	7.5
2	26.5	0.5	Organics	4 Prickly Sculpin	3.0 - 5.0

Lake: **ROYER**

INDIVIDUAL FISH DATA

Date Captured: June 18, 1989

Method of Capture: Sinking monofilament gillnet

M -Male
F -Female
? -Not Obvious

IMM -Immature
MG -Maturing
MT -Mature
GV -Gravid
SP -Spent
7 -Not Obvious

EG -Egg
FR -FinRay
HD -Head
ML -Milt
OT -Otolith

SC -Scale
ST -Stomach
TG -Fish Tag
WF -Whole Fish

Species	Fork Length (cm)	Weight (g)	Sex	Gonadal maturity	Sample Type	Age (yr)	Plankton	Stomach Contents Insects	Fish	Other	Comments
Rainbow	13.1	40	M	IMM	SC	1+	Zooplankton				
Rainbow	25.2	160	F	MG	SC	3+		Terrestrial Chironomids			
Rainbow	25.9	150	M	MG	SC	2+	Zooplankton	Chironomids			
Rainbow	26.1	160	f	MG	SC	2+		Beetles; Mosquitoes; Terrestrial Insects			Angled
Rainbow	34.8	350	f	MG	SC	3+		Dragonfly; Terrestrial Insects			Stomach full
MWF	14.4	140	f	MG	SC	3+					
MWF	23.0	125	M	MG	SC	2+					
MWF	23.1	140	M	MG	SC	2+					
MWF	23.5	120	F	MG	SC	4+	Zooplankton				Eggs in body cavity
MWF	23.5	120	M	MG	SC	3+					
MWF	23.5	130	M	MG	SC	3+					
MWF	24.2	130	F	MG	SC	3+					
MWF	24.2	130	F	MG	SC	4+					Stomach empty
MWF	24.4	130	F	MG	SC	5+					
MWF	24.4	145	M	MG	SC	4+	Zooplankton				
MWF	24.5	140	M	MG	SC	3+					
MWF	24.8	140	F	MG	SC	4+					
MWF	24.9	190	F	MG	SC	3+					Stomach empty
MWF	24.9	160	F	MG	SC	4+					
MWF	24.9	160	F	MG	SC	4+	Zooplankton				Eggs in body cavity
MWF	25.0	140	M	MG	SC	4+					
MWF	25.5	120	F	MG	SC	4+		Chironomids			
MWF	25.5	140	F	MG	SC	4+		Chironomids			
MWF	25.5	150	M	MG	SC	3+					
MWF	25.5	160	M	MG	SC	4+					Stomach empty
MWF	26.0	160	F	MG	SC	3+					
MWF	26.0	180	M	MG	SC	5+					Stomach empty
MWF	26.6	165	F	MG	SC	3+					Stomach empty
MWF	26.9	200	F	MG	SC	4+				Detritus	Eggs in body cavity
MWF	27.0	200	F	MG	SC	3+		Chironomids			
MWF	27.1	265	M	MG	SC	4+	Zooplankton				
MWF	28.0	230	F	MG	SC	6+	Zooplankton				
MWF	28.5	210	F	MG	SC	4+		Chironomids			
MWF	29.0	240	F	MG	SC	4+		Terrestrial Insects; Chironomids			
MWF	29.4	320	F	MG	SC	7+		Terrestrial Insects; Chironomids			

* MWF = Mountain Whitefish

Lake: ROYER

INDIVIDUAL FISH DATA (con't)

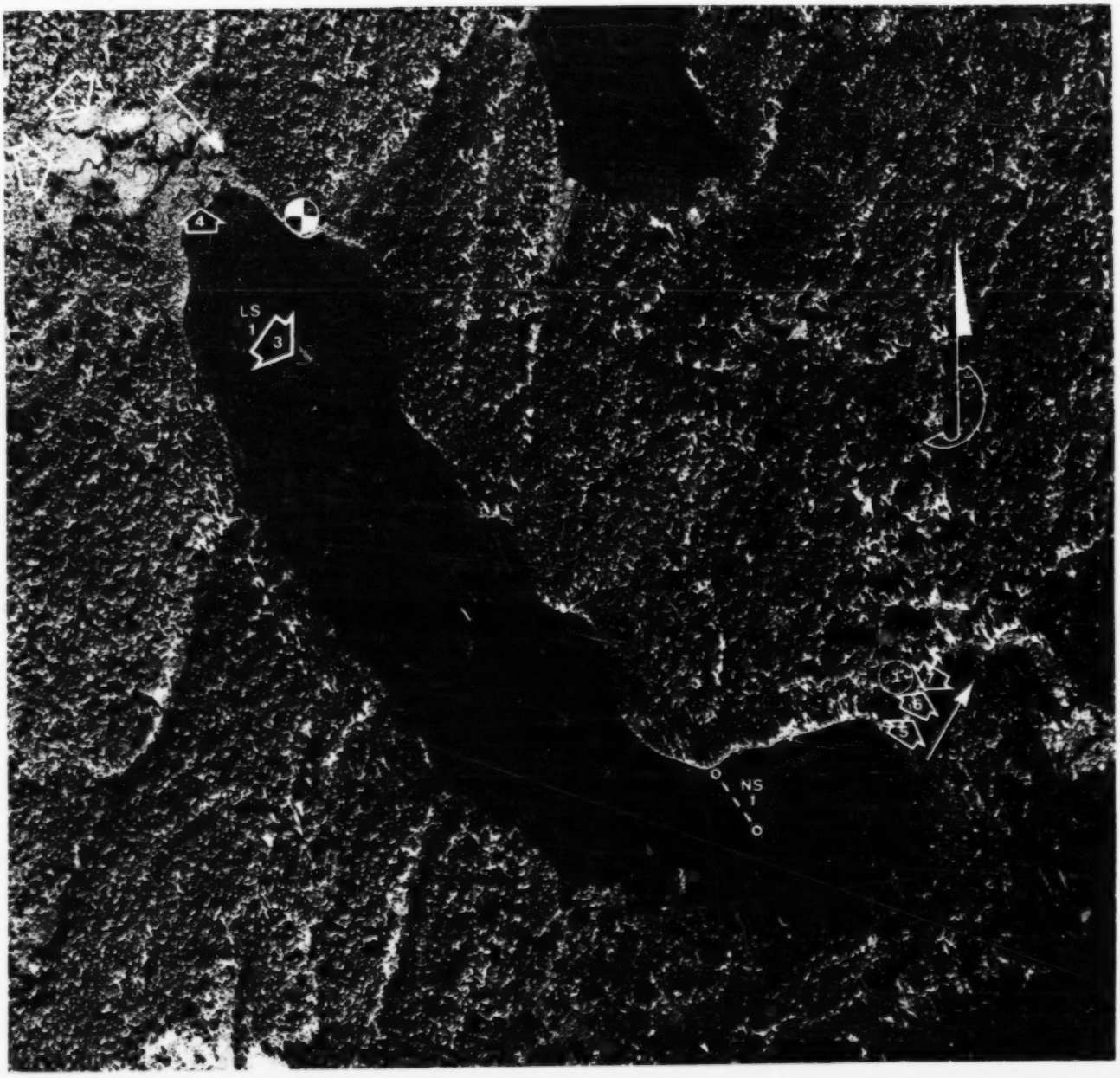
Date Captured: June 29, 30, 1989

Method of Capture: Sinking monofilament gillnet

Lengths and weights only on the following:

* MWF = Mountain Whitefish

SPECIES	FORK LENGTH (cm)	WEIGHT (g)
MWF	23.0	100
MWF	23.0	120
MWF	23.9	140
MWF	24.1	130
MWF	24.2	140
MWF	24.2	140
MWF	24.3	140
MWF	24.3	140
MWF	24.5	140
MWF	25.0	160
MWF	25.3	140
MWF	25.3	160
MWF	25.4	160
MWF	25.7	145
MWF	26.5	180
MWF	27.2	180
MWF	27.3	190
MWF	27.7	200
MWF	28.0	195
MWF	29.0	220
MWF	30.0	320



LOCATION OF INVENTORY SITES

Figure 1

Lake: Royer
Reference No.: B.C. 7443:207
Reference Date: September 3, 1977
Scale: 1: 8154

1 Plate number, area, and direction

2 Point sample, number, and location

Bench mark

LS 1 Limno station location and number

O-NS 1-O Netting site location and number

1 Stream flow direction and number

Lake: ROYER

PHOTOGRAPH DIRECTORY

Negative #	Plate #	Description
R4: 19A	1	Aerial view of Royer Lake looking southeast. Inlet is visible in foreground.
R4: 21A	2	Aerial view of inlet flowing into the north end of Royer Lake. Arrow indicates approximate location of bench mark and overnight camp.
R4: 22A, 23A, 24A	3	Panoramic view of shoreline looking southeast from limno station.
R5: 7, 8	4	Panoramic view of inlet looking upstream from lake.
R5: 3	5	View of outlet to Royer Lake looking downstream approximately 25 m from lake.
R5: 5	6	View looking downstream of point sample site on outlet, approximately 75 m from lake.
R5: 4	7	View looking upstream of point sample site on outlet, approximately 75 m from lake.

Plate 1: Aerial view of Royer Lake looking southeast. Inlet is visible in the foreground.

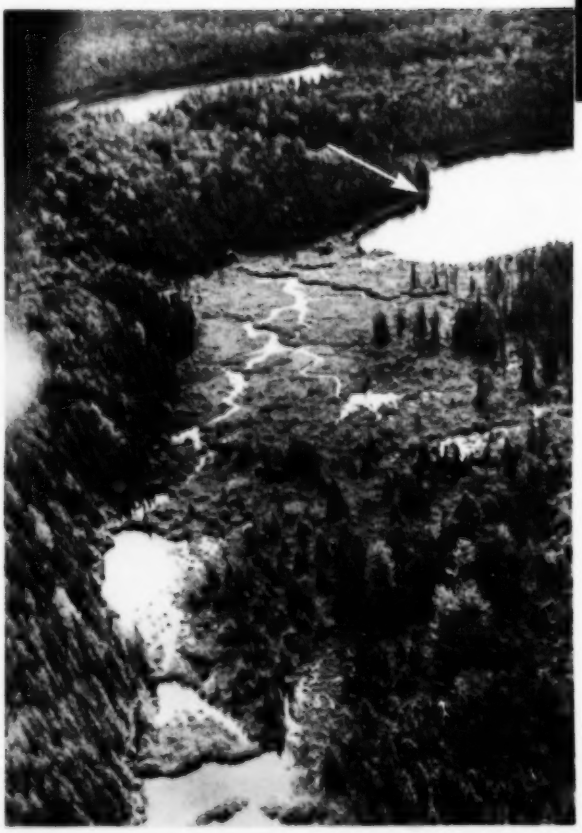


Plate 2: Aerial view of inlet flowing into the north end of Royer Lake. Arrow indicates approximate location of bench mark and overnight camp.

Plate 3: Panoramic view of shoreline looking southeast from limno station.

Plate 4: Panoramic view of inlet looking upstream from lake.

Plate 5: View of outlet to Royer Lake looking downstream, approximately 25 m from lake.

Plate 6: View looking downstream of point sample site on outlet, approximately 75 m from lake.

Plate 7: View looking upstream of point sample site on outlet, approximately 75 m from lake.

Lake: **ROYER**

Appendix A

LABORATORY REPORT

Water Chemistry Analysis

B C LABORATORY SERVICES

Report for form 03000114

Omineca-Peace - Fish Program ATTN: DUANE JESSON

Site. NOSITE ROYER LAKE

Submitted by (00000) DUANE JESSON

Address (00) RECREATIONAL FISHERIES
1011 FOURTH AVENUE
PRINCE GEORGE, B.C.
V2L 3H9

Phone No 565-6944

B.C. MINISTRY OF ENVIRONMENT
AUG 18 1989
PRINCE GEORGE, B.C.

Audit Sample ( )
Client study reference code ( )
Sampling agency code (91)

Site (NOSITE) ROYER LAKE

Sample Adjective ( )
Sample State (FW) Fresh Water
Sample Descriptor ( ) Undefined

This form was processed to the computer on 5-JUL-1989 as REGULAR
The cost for analyzing samples for this form is

Routine analysis	$	112.80
Special analysis	$	0.00
Total	$	112.80

Site: NOSITE ROYER LAKE

From 89/06/29:0001 To 89/06/29:0001
Depth Range 0.0 0.0 Tide
Sample State Fresh Water
Sample Comment

Parameter Description	Result	Units	Analytical Technique (Sparcode/Medium/Pres'n)
pH	?	pH units	Automated pH Meter (00041220/02/01)
Result 7.9, pH units. Analyzed outside of optimal time frame.			
Residue Nonfilt.	< 1	mg/L	Grav, 9 cm Buchner, 105C (00081070/02/01)
Specific Conductance	109	uS/cm	Cond. Meter Siebold (00111160/02/01)
Res Filterable 1.0u	76	mg/L	Gravimetric 1.0u Filter (007H1032/02/01)
Alkalinity Total 4.5	?	mg/L	Automated Electrometer (01021210/02/01)
Result 93.1, mg/L. Analyzed outside of optimal time frame.			

Site: NOSITE ROYER LAKE

From: 89/06/29 0002 To: 89/06/29 0002
Depth Range: 9.0 9.0 Tide:
Sample State: Fresh Water
Sample Comment:

Parameter Description	Result	Units	Analytical Technique (Sparcode/Medium/Pres'n)
pH	7	pH units	Automated pH Meter (00041220/02/01)
Result: 7.2, pH units. Analyzed outside of optimal time frame.			
Residue Nonfilt	< 1	mg/L	Grav: 9 cm Buchner, 105C (00081070/02/01)
Specific Conductance	121	uS/cm	Cond Meter Siebold (00111160/02/01)
Res. Filterable 1.0u	86	mg/L	Gravimetric 1.0u Filter (007H1032/02/01)
Alkalinity Total 4.5	7	mg/L	Automated Electrometer (01021210/02/01)
Result: 59.0, mg/L. Analyzed outside of optimal time frame			

Lake: **ROYER**

Appendix B

TRIBUTARY STREAM DATA

Lake: ROYER

System Name: **Unnamed Creek** **outlet**

System No.: **230-9068-439-822-190**

Site location: Sample Site #1, 75 m downstream from lake.

Channel Width:	6.3m	Water Temp.:	15°C
Wetted Width:	2.8m	Stage (flow):	moderate
Max. Depth:	13.5cm	Velocity:	0.5 m/sec
Avg. Depth:	8.0cm	Slope:	3.5%
Turbidity:	13.5cm	Colour:	tannic

Bed Material: Compaction: Moderate (low in spots)

fines:	< 1%
gravels:	45% = 30% large gravel; 15% small gravel
larges:	55% = 50% cobble; 5% boulder
bedrock:	0%

Banks (form, height, stability):

Right bank: steep (undercut at higher flows)/35 cm/stable-root wads
Left Bank: flat/5 cm/stable-cobble bar with rooted trees and grasses

Comments:

Site is a riffle.
Approximately 2% of small gravel is sand.
Rearing fair to good due to complexity and cover.
Spawning fair to good.
Overhang stream cover approx. 25% at site, with grasses and alder.
Evidence of old reeds.
Good pool to riffle ratio.